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UNITED STATES DEPARTMENT OF AGRICULTURE

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A BIBLIOGRAPHY RELATING TO SOIL ALKALIES

Compiled with Special Reference to the Deleterious Action of Soil Alkalies, and Various Other Chemical Agents on Cement and Concrete

Compiled under the direction of

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WORD AND PHRASE ABBREVIATIONS

Abs	Abstract.
Ag	Agriculture.
An	Annual.
Ass'n	Association.
Bd	Board.
Bul	Bulletin.
Col	Column.
Concl	Conclusions.
Disc	Discussions.
Ed. Comment	Editorial Comment.
Eng	Engineer, Engineering.
Exten. Abs	Extensive Abstract.
Exc	Excerpts.
Inst	Institute.
Int	International.
Jour	Journal.
Min	Minutes.
Munic	Municipal.
Proc	Proceedings.
Pt	Port.
Rpt	Report.
Sect	Section.
Ser	Series.
Soc	Society.
Suppl	Supplement.
Tech	Technical.
Trans	Transactions.
U. S. D. A.	U. S. Department of Agriculture.
U. S. G. S	U. S. Geological Survey.

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ABBREVIATIONS FOR NAMES OF PERIODICALS CITED

Am. Cer. Soc. Trans	American Ceramic Society. Transactions.
Am. Chem. Soc. Jour	American Chemical Society. Journal.
Am. Contr	American Contractor.
Am. Port Auth. Proc. & Papers	American Port Authorities, Proceedings and Papers.
Ann. des. P. et Chs	Annales des Ponts et Chaussees.
A. P. C. M. Bul	Association of American Portland Cement Manufacturers. Bulletin.
A. P. C. M. Min	Association of American Portland Cement Manufacturers. Minutes.
A. Ry. E. A. Bul	American Railway Engineering Association. Bulletin.
A. Ry. E. A. Proc	American Railway Engineering Association. Proceedings.
A. Ry. E. & M. W. A. Bul	American Railway Engineering and Maintenance of Way Association. Bulletin.
A. S. C. E. Proc	American Society of Civil Engineers. Proceedings.
A. S. C. E. Trans	American Society of Civil Engineers. Transactions.
A. S. M. E. Jour	American Society of Mechanical Engineers Journal.
A. S. T. M. Proc	American Society for Testing Materials. Proceedings.
A. W. W. A. Proc	American Water Works Association. Proceedings.
Ariz. Sta. Bul	Arizona Agricultural Experiment Station Bulletin.
Balt. Eng. Club Jour	Baltimore Engineering Club Journal.
Bet. u. Eis	Beton und Eisen.
Calif. Sta. Bul	California Agricultural Station. Bulletin.
Calif. Sta. Rpt	California Agricultural Station. Report.
Can. Cem. & Conc. Rev	Canadian Cement and Concrete Review.
Can. Eng	Canadian Engineer.
Can. Eng. Inst. Jour	Canadian Engineering Institute. Journal.
Cement	Cement.
Cem. Age	Cement Age.
Cem. & Eng. N	Cement and Engineering News.
Cem. Era	Cement Era.
Chem. Abs	Chemical Abstracts.
Chem. Eng	Chemical Engineer.
Chem. & Met. Eng	Chemical and Metallurgical Engineering (Met. and Chem. Eng. up to 1918).
Chem.-Zeit	Chemiker-Zeitung.
Ciment	Ciment.
Colo. Sta. Bul	Colorado Agricultural Experiment Station. Bulletin.
Concrete	Concrete.
Conc. Cem. Age	Concrete-Cement Age.
Conc. & Const. Eng	Concrete and Constructional Engineering.
Conc. Eng	Concrete Engineering.
Contract Rec	Contract Record.
Dinglers Polytech. Jour	Dinglers Polytechnisches Journal.
Dom. Eng	Domestic Engineering.
Engineer	Engineer.
Engineering	Engineering.
Eng. & Contr	Engineering and Contracting.
Eng. Mag	Engineering Magazine.
Eng. N	Engineering News.
Eng. N. Rec	Engineering News Record.
Eng. Rec	Engineering Record.
Exper. Sta. Rec	Experiment Station Record (U. S. D. A.).
Franklin Inst. Jour	Franklin Institute. Journal.
Gesundheits-Ingenieur	Gesundheits-Ingenieur.
Harvard Eng. Jour	Harvard Engineers Journal.

Iowa Sta. Bul	Iowa Agricultural Experiment Station. Bulletin.
Idaho Eng. Soc. Jour	Idaho Engineers Society. Journal.
Idaho Sta. Bul	Idaho Agricultural Experiment Station. Bulletin.
Inst. Civil Eng. (Lond.) Min. & Proc.	Institution of Civil Engineers, London. Minutes and proceedings.
Int. A. T. M. Proc	International Association for Testing Materials. Proceedings.
Off Rpts	Official reports.
Non. Off. Papers	Nonofficial papers.
Int. Eng. Cong. Trans	International Engineering Congress. Transactions.
Int. Marine Eng	International Marine Engineering. (Now Marine Engineering and Shipping Age.)
Jour. Ag. Research	Journal of Agricultural Research (U. S. D. A.).
Jour. Ind. & Eng. Chem	Journal of Industrial and Engineering Chemistry.
Lond. Chem. Soc. Jour	London Chemical Society. Journal.
Met. & Chem. Eng	Metallurgical and Chemical Engineering. (Chem. & Met. Eng. after 1918.)
Mich. Sta. Bul	Michigan Agricultural Experiment Station. Bulletin.
Mitt. Kgl. Matpr	Mitteilungen aus dem Koniglichen Materialprufungsamt zu Berlin-Lichter-felde-West.
Mont. Sta. Bul	Montana Agricultural Experiment Station. Bulletin.
Munic. Eng	Municipal Engineering.
N. A. Cem. Users Proc	National Association of Cement Users. Proceedings.
N. Mex. Sta. Bul	New Mexico Agricultural Experiment Station. Bulletin.
N. Y. (city) Pub. Imp. Div. Rpt.	New York (City) Board of Estimates and Appropriations. Division of Public Improvements. Report.
N. Y. (city) Water Supply Bd. An. Rpt.	New York (City) Board of Water Supply Annual Report.
Ohio Sta. M. Bul	Ohio Agricultural Experiment Station Monthly Bulletin.
Philippine Jour. Sci	Philippine Journal of Science.
Portland Cem. Ass'n Min	Portland Cement Association. Minutes.
Prof. Mem	Professional Memoirs. (United States Army.)
Pub. Rds	Public Roads.
Pub. Wks	Public Works.
Rcl. Rec	Reclamation Record.
Russ. Jour. Exper. Landw	Russisches Journal fur Experimentelle Landwirtschaft. (Zhurnal Opuitnoi Agronomia.)
Ry. Age Gaz	Railway Age Gazette.
Ry. Eng	Railway Engineer.
St. Louis Eng. Club Jour	Engineers Club of St. Louis (Mo.). Journal.
Sci. Am	Scientific American.
Sci. Am. M	Scientific American Monthly.
Sci. Am. S	Scientific American Supplement.
Soc. Chem. Ind. Jour	Society of Chemical Industries. Journal.
Soc. d'Encour. l'Ind. Nat. Bul	Societe d'Encouragement pour l'Industrie Nationale. Bulletin.
Stadt. Tiefb	Der Stadtische Tiefbau.
Surveyor	Surveyor and Municipal and County Engineer.
Ton. Zeit	Tonindustrie-Zeitung.
U. S. Bur. Soils Bul	United States Department of Agriculture. Bureau of Soils. Bulletin.
U. S. Bur. Stand. Tech. Paper	United States Department of Commerce. Bureau of Standards. Technologic paper.
U. S. D. A. Bul	United States Department of Agriculture. Bulletin.
U. S. G. S. Bul	United States Department of Interior. Geological Survey. Bulletin.
Utah Sta. Bul	Utah Agricultural Experiment Station. Bulletin.

W. Soc. Eng. Jour	Western Society of Engineers. Journal.
Was. u. Abw	Wasser und Abwasser.
Waterpf. & Firepf	Waterproofing and Fireproofing.
Wis. Eng	Wisconsin Engineer.
Wis. Sta. Bul	Wisconsin Agricultural Experiment Station. Bulletin.
Wyo. Sta. Bul	Wyoming Agricultural Experiment Station. Bulletin.
Zeit. Ang. Chem	Zeitschrift fur Angewandte Chemie.

The references contained in this bulletin were compiled in connection with an investigation by the Bureau of Public Roads of the effect of soil alkalies on concrete drain tile. The bibliography is believed to be fairly complete in respect to articles published prior to 1924. The importance of the problem presented by the use of concrete structures in sea water and in soils containing various acids and alkalies has long been recognized. To one engaged in the study of any phase of the problem the literature extant is indispensable. Such a compilation necessarily requires considerable time and labor, and in order that the results of this search may be made accessible to as many as possible the bibliography is published as a bulletin.

EXPLANATORY NOTES

The references are arranged alphabetically by authors under each of the six headings. Each article is placed under the heading which most nearly describes its main content and those which fall under more than one heading are cross-indexed. The Roman numerals used in connection with authors' names indicate the headings under which the cross-indexed references appear. Plural authorship is cross-indexed in a like manner. At the end of the groups are lists of references, arranged alphabetically by titles, referring to articles the authorship of which is not indicated. These are also cross-indexed by Roman numerals. The abstract in each case refers to the first reference given under the title. The other references under a given title may or may not be of the same title, but are concerned with the same subject matter. Inclusive paging is not always given for these supplementary references.

I. SOIL ALKALINITY

ORIGIN, DISTRIBUTION, PHYSICAL AND CHEMICAL PROPERTIES AND TREATMENT

ALADJEM, R. *Decomposition of Nitrates as a Possible Cause of Formation of Sodium Carbonates in Egyptian Soils.* Cairo Scientific Jour., v. 6 (1912), p. 301–302.
Outline of tests to determine effect of continuous water-logged condition upon nitrification of soils.

AMES, J. W. *Some Alkali Soils in Ohio.* Ohio Sta. M. Bul. 1 (1916), p. 209-210.
Nontechnical discussion.

BANCROFT, R. L. *Alkali Soils of Iowa.* Iowa Sta. Bul. 177 (1918), 22 p.
A study of conditions and methods for correction. Diagrammatic and tabular data.

BEESON, J. L. *Physical Effects of Various Salts and Fertilizer Ingredients Upon a Soil as Modifying the Factors Which Control Its Supply of Moisture.* Am. Chem. Soc. Jour., v. 19 (1897), p. 620–649.
Experiments on rate of saturation, percolation, capillary rise, and evaporation as affected by salts. Tabular data.

BERGE, R. *Emploi de la Chaux et des Craies Broyees Pour Corriger L'Acidite des Sols.* Academie d'agriculture (France), Comptes Rendus, v. 6 (1920), p. 934–9.

BREAZEALE, J. F. *Formation of Black Alkali (Sodium Carbonate) in Calcareous Soils.* Jour. Ag. Research, v. 10 (1917), p. 541–589.
Extended technical discussion of formation of black alkali from sodium salts and calcium carbonate and retarding effects of various other salts. Action of black alkali on soil and vegetation. Results of laboratory tests. Much tabular data. Bibliography.

BRIGGS, L. J. *Electrical Instruments for Determining the Moisture, Temperature, and Soluble Salt Content for Soils.* U. S. Bur. Soils Bul. 15 (1899), 35 p.
Detailed description of electric hygrometer, electric soil thermometer, and electrolytic soil bridge, their use and adjustments. Diagrammatic and tabular data. Illustrated.

BRIGGS, L. J. and M. W. LAPHAM. *Influence of Dissolved Salts on the Capillary Rise of Soil Waters.* U. S. Bur. Soils Bul. 19 (1902), p. 5–18.
Laboratory tests on soil from James Island, S. C. Tabular data and drawings.

BROWASH, A. H. See SHUTT, F. T., and A. H. BROWASH, I.

BROWN, O. F., and R. A. HART. *Reclamation of Seeped and Alkali Lands.* Utah Sta. Bul. 111 (1910), p. 75–92.
Recommendations concerning drainage and subsequent treatment of alkali lands. Diagrams. Illustrated.

BROWN, P. E. See STEVENSON, W. H., and P. E. BROWN, I.

BURD, J. S. *Alkali and the Treatment of Alkali Lands (I and II).* Idaho Sta. Bul. 44 (1904) and 51 (1905), 10 p. and 20 p.
Discusses origin, nature, effects of alkali in soil and water. Drainage as a reclamation measure. Tabular data.

BUTT, N. I. See HARRIS, F. S., and N. I. BUTT.

CAMERON, F. K. *Alkali.* "The Soil Solution" (Easton, Pa., 1911), p. 110–125.
General discussion of the origin and distribution of alkali. Drainage as a reclamation measure. Tabular data.

——— *Formation of Sodium Carbonate, or Black Alkali, by Plants.* U. S. D. A. Rpt. 71 (1902), p. 61–70.
General discussion. Considers specific plants. Tabular data.

——— and H. E. PATTEN. *Removal of Black Alkali by Leaching.* Amer. Chem. Soc. Jour., v. 28 (1906), p. 1639–1649.
Investigations and conclusions as to methods and success of such reclamation. Tabular data.

CLARKE, F. W. *Data of Geochemistry.* U. S. G. S. Bul. 695 (1920), 832 p. *Ibid.*, Bul. 616 (1916), 821 p.
A critical summary of existing knowledge and guide to important literature on the subject.

COLE, L. H. *Alkali Deposits of Western Canada.* Can. Eng., v. 40 (1921), p. 460.
Discusses nature and distribution of alkali salts in waters and soils.

CRAWLY, J. T. *Water-Holding Power and Irrigation of Hawaiian Soils. The Application of Nitrate of Soda. The Accumulation of Salt in Hawaiian Soils.* Hawaiian Planters, v. 21 (1902), p. 358–63. Abs., Exper. Sta. Rec., v. 14, p. 555.
Discusses irrigation, fertilization, and salt concentrations in Hawaiian sugar lands. Tabular data.

DEAKIN, A. *Irrigated India.* (London, 1893), 322 p.
Narrative account of India: Its people, their activities, and in particular, the irrigation systems.

DIMO, N. A. *Influence of Irrigation and of Increased Natural Humidity on the Process of Soil Formation and of the Transportation of Salts in the Soils and Subsoils of the Golodnoi (Hungary) Steppe.* Russ. Jour. Exper. Landw., v. 15 (1914), p. 136–138. Abs., Exper. Sta. Rec., v. 34, p. 16.
A study of the compositions of soils and waters.

DORSEY, C. W. *Alkali Soils of the United States.* U. S. Bur. Soils Bul. 35 (1906), 196 p.
Review of literature and summary of information to date on origin, nature, distribution, and treatment of soil alkali. Maps and tabular data.

———. *Reclamation of Alkali Land in Salt Lake Valley, Utah.* U. S. Bur. Soils Bul. 43 (1907), 28 p.
Describes alkali conditions and methods of reclamation. Tabular data. Illustrated.

———. *Reclamation of Alkali Soils.* U. S. Bur. Soils Bul. 34 (1906), 30 p.
Origin, accumulation, and effects of soil alkali. Prevention of accumulation, and physical and chemical methods of reclamation. Illustrated.

———. *Reclamation of Alkali Soils at Billings, Montana.* U. S. Bur. Soils Bul. 44 (1907), 21 p.
Describes alkali conditions and methods of reclamation.

FORBES, R. H. *River Irrigating Waters of Arizona—Their Character and Effects.* Ariz. Sta. Bul. 44 (1902), 68 p.
Study of contents and value of irrigating waters. Diagrammatic and tabular data. Illustrated.

GARDNER, F. D., and J. STEWART. *Soil Survey in Salt Lake Valley, Utah.* U. S. D. A. Rpt. 64 (1899), p. 77–113.
Reports investigation of soil and waters with respect to alkali conditions. Diagrammatic and tabular data. Illustrated.

GAUDECHON, H. See MUNTZ, A., and H. GAUDECHON, I.

GEDROITS, K. K. *Colloidal Chemistry in the Study of Soils.* Russ. Jour. Exper. Landw. 13 (1912), p. 363–420. Abs., Exper. Sta. Rec., v. 28, p. 516.
Study of colloidal substances and soluble salts in soils.

GREAVES, J. E. See STEWART, R., and J. E. GREAVES, I.

GREAVES, J. E., and C. T. HIRST *Composition of the Irrigation Waters of Utah.* Utah Sta. Bul. 163 (1918), 43 p.
A study of salts found in waters of Utah with suggestions as to irrigation methods. Diagrams and tabular data. Illustrated.

HARRIS, F. S. *Movement of Soluble Salts with the Soil Moisture.* Utah Sta. Bul. 139 (1915), p. 119–124.
Discusses alkali accumulations as due to movement of salts in solution; evils of over-irrigation. Tabular data. Diagrams.

———. *Soil Alkali.* (New York and London, 1920), 246 p.
General treatise on origin, distribution, effects and treatment of alkali soils. Discusses physical, chemical and biological aspects, reclamation and cropping. Tabular data. Illustrated.

HARRIS, F. S., and N. I. BUTT. *Effect of Irrigation Water and Manure on the Nitrates and Total Soluble Salts of the Soils.* Jour. Ag. Research, v. 8 (1917), p. 333–359.
Experimental investigations in Utah and deductions. Bibliography. Diagrams and tables.

HARRIS, F. S., and J. S. ROBINSON. *Factors Affecting the Evaporation of Moisture from the Soil.* Jour. Ag. Research, v. 7 (1916), p. 439–461.
Experimental investigations and results, with bibliography. Tables and diagrams.

HART, R. A. *Drainage of Irrigated Farms.* U. S. D. A., Farmers' Bul. 805 (1917), 31 p.
Discusses need and benefits of draining irrigated lands. Describes methods of design and installation.

———. *Drainage of Irrigated Land.* U. S. D. A. Bul. 190 (1915), 34 p.
Discusses need, methods, design, construction, maintenance and cost.
See also BROWN, C. F., and R. A. HART, I.

HEADDEN, W. P. *Alkalies in Colorado* (including nitrates) Colo. Sta. Bul. 239 (1918), 58 p.
Formation, nature, effects, and differences of "white" and "black" alkalies and nitrates.

———. *"Black Alkali" in the San Luis Valley.* Colo. Sta. Bul. 231 (1917), 15 p.
Discusses effects on agriculture of detrimental amounts of "black alkali" in San Luis Valley, Colo. Suggests gypsum treatment of soil as remedy.

———. *Colorado Irrigation Waters and Their Changes.* Colo. Sta. Bul. 82 (1903), 77 p.
Extensive investigations and analyses of ground and surface waters. Much tabular data.

———. *Fixation of Nitrogen.* Colo. Sta. Buls. 155 (1910), 48 p.; 178 (1911), 96 p.; and 186 (1913), 47 p.
Discusses the formation, nature and effects of nitre, often mistaken for "black alkali."

———. *Soil Study, III. The Soil.* Colo. Sta. Bul. 65 (1901), 55 p.
Colorado soil study. Special reference to soluble salts.

———. *Soil Study, IV. The Ground Water.* Colo. Sta. Bul. 72 (1902), 47 p.
Physical and chemical aspects of ground water in Colorado. Alkali effects discussed. Tabular data.

HILGARD, E. W. *Lakes of the San Joaquin Valley.* Calif. Sta. Bul. 82 (1889), 4 p.
Study of salt content.

———. *Quality of Irrigation Water.* Soils. (New York, 1911), p. 246–253.
Discusses allowable concentration of soluble salts and precautions in use for irrigation. Concerns effects on vegetation only.

———. *Soils.* (New York, 1911), 593 p.
General treatise on soils; their origin, nature, properties and relations to physical laws and life.
See also SNOW, F. J., HILGARD, E. W., and G. W. SHAW, I.

HILGARD, E. W. and R. H. LOUGHRIDGE, *Distribution of Salts in Alkali Soils.* Calif. Sta. Rpt. (1894–95), p. 37–72.
Discusses nature, formation, transportation, and effects of various alkali salts in soils and waters as affected by natural forces, and agricultural methods. Many diagrams and tables. Results of field investigations.

HILGARD, E. W., and others. *Alkali and Alkali Soils.* Calif. Sta. Rpt., (1893–94), p. 140–156.
A study of California soils as to kinds and concentration of salts. Reclamation by gypsum discussed. Tabular data. Illustrated.

HILL, E. G. *Analysis of Reh, the Alkali Salts in Indian Usar Land.* Lond. Chem. Soc. Proc., v. 19 (1903), p. 58–60. Abs., Exper. Sta. Rec., v. 14, p. 1056.
Describes chemical analyses. Tabular results.

HIRST, C. T. See GREAVES, J. E., and C. T. HIRST, I.

HISSINK, D. J. *Influence of Various Salt Solutions on the Permeability of Soils.* Chemisch Weekblad, v. 4 (1907), p. 663–670. Abs., Chemisches Zentralblatt (1907), II, No. 26, p. 2071. Abs., Lond. Chem. Soc. Jour., v. 92 (1907), part 2, p. 984. Abs., Exper. Sta. Rec., v. 20, p. 16.
Results of laboratory experiments with various solutions.

KING, F. H. *Investigations in Soil Management.* (Madison, Wis., 1904), 168 p.
Discussion and conclusions of investigation of (1) Effects of manure soil dressing on crop yield and soluble salt content; (2) Movements of soluble salts in soils; and (3) Absorption of soluble salts by soil types. Tabular and diagrammatic data. Illustrated.

———. *Principles and Conditions of the Movements of Ground Water.* U. S. G. S. 19th An. Rpt. (1897–98), part 2, p. 59–286.
Discussion of ground-water movement in its various physical aspects with results and conclusions of extensive laboratory and field experimental investigations. Diagrammatic and tabular data. Illustrated.

KNIGHT, W. C., and E. C. SLOSSON. *Alkali.* Wyo. Sta. Bul. 49 (1901), p. 75–79.
Short discussion of sources and nature of various salts.

KOLOTOV, G. I. *Movement of Salts in Semi-arid Soils.* Russ. Jour. Exper. Landw., v. 12 (1911), p. 832–833. Abs., Exper. Sta. Rec., v. 28, p. 421.
Examination discussed.

KOSSOVICH, P. See TULAYKOV, N., and P. KOSSOVICH, I.

KOSSOVITCH, P. S. *Water-raising Capacity of Soils.* Russ. Jour. Exper. Landw., v. 11 (1910), p. 734.

KRAVKOV, S. *On the Movement of Water and Salt Solutions in Soils.* Journal für Landwirtschaft, v. 48 (1900), p. 209–222. Abs. Exper. Sta. Rec., v. 12, p. 620.
Laboratory experiments determine movement as affected by various conditions.

LAPHAM, M. W. See BRIGGS, L. J., and M. W. LAPHAM, I.

LEATHER, J. W. *Investigations on Usan [Alkali] Land in the United Provinces.* Allahabad, India, Govt. (1914), 88 p. Abs., Exper. Sta. Rec., v. 33, p. 419.
An investigation of soil and waters with respect to origin, accumulations and movement of alkali salts. Conclusions regarding effects of irrigation and methods of reclamation. Tabular and diagrammatic data. Illustrated.

LIPMAN, C. B. *New Experiments on Alkali Soil Treatment.* Univ. Calif. Publications in Agricultural Sciences, v. 1 (1915), p. 275–282.
Preliminary report on laboratory experiments with various chemical treatments. Tabular data. Illustrated.

LOUGHRIDGE, R. H. See HILGARD, E. W., and R. H. LOUGHRIDGE, I.

LOUGHRIDGE, R. H., and C. H. SHINN. *Reclamation Tests with Gypsum in Alkali Soils.* Calif. Sta. Rpt. (1891–92), Part 1, p. 80–90.
Describes experiments at Tulare Station. Tabular data.

MACKIE, W. W. *Reclamation of White-ash Lands Affected with Alkali at Fresno, Calif.* U. S. Bur. Soils Bul. 42 (1907), 47 p.
Reclamation of hard-pan lands. Tabular data. Illustrated.

MANN, H. H., and V. A. TAMHANE. *Salt Lands of the Nira Valley (India).* Bombay Presidency, Dept. Ag. Bul. 39 (1910), 35 p.
Discusses source, distribution, kinds and concentration of salts, the cropping and reclamation of the lands. Special reference to drainage. Tabular data.

MCCOOL, M. M., and C. E. MILLAR. *Soluble Salt Content of Soils and Some Factors Affecting It.* Mich. Sta. Tech. Bul. 43 (1918), 47 p.
Occurrence and movement of soluble salts as affected by natural forces. Diagrammatic and tabular data.

MCOWEN, P. *Brak Land in Relation to Irrigation and Drainage.* Agricultural Journal (Cape of Good Hope) v. 22 (1903), p. 573–81.
Discusses alkali lands of South Africa and chemical treatment, drainage and reduction of evaporation as corrective measures. Tabular data.

MEANS, T. H. *Rapid Method for the Determination of the Amount of Soluble Mineral Matter in a Soil.* Am. Jour. of Sci., v. 7 (1899), p. 264–266.
Description of electrical soil bridge and its use.

———. *Reclamation of Alkali Lands in Egypt.* U. S. Bur. Soils Bul. 21 (1903), 48 p.
Rather detailed description of Egyptian reclamation work as adapted to similar work in United States of America. Tabular and diagrammatic data. Illustrated.

See also WHITNEY, M., and T. H. MEANS, I.

MILLAR, C. E. See MCCOOL, M. M., and C. E. MILLAR, I.

MILLER, D. G. *Seepage and Alkali Problem in the Grand Valley, Colo.* U. S. Bur. of Public Roads, mimeographed report, March, 1916.
This report deals with the practical phases of the problem of reclaiming lands that have become nonproductive due to alkali.

MUNTZ, A., and H. GAUDECHON. *Diffusion of Fertilizer in the Soil.* Annales de l'Institute National Agronomique (Paris), 2 Ser. 7 (1908), p. 205–238. Comptes Rendus des Academie Science (Paris), v. 148 (1909), No. 5, p. 253–258. Abs., Exper. Sta. Rec., v. 21, p. 23. Abs., Lond. Chem. Soc. Jour., v. 96 (1909), No. 557, II, p. 259. Abs., Chem. Abs., v. 3 (1909), p. 1197.
Observations of diffusion under various conditions described. Conclusions and diagrammatic and tabular data. Illustrated.

NOYES, H. A. *Soil Acidity, the Resultant of Chemical Phenomena.* Jour. Ind. and Eng. Chem., v. 11 (1919), p. 1040–1049.
Describes laboratory experiments on cause of soil acidity. Considerable technical detail. Tabular and diagrammatic data.

O'BRINE, D. *Alkali Soils of Colorado.* Colo. Sta. Bul. No. 9 (1889), 12 p.
Discusses nature and effects of salts and reclamation by drainage.

PAGNOUL, A. *Moisture and Absorptive Power of Soils.* Terres Arables du Pas-de-Calais, Arras (1894), p. 128. Ex. Abs., Exper. Sta. Rec., v. 6 (1894), p. 118.
Part of a detailed report on the investigation of 97 soils of the Pas-de-Calais.

PATTEN, H. E. See CAMERON, F. K. and H. E. PATTEN, I.

PEGLION, D. V. *Saline Soil of the Lower Valley of the Po (Italy).* Atti della Reale Accademia Economico-Agraria Dei Georgofili di Firenze, v. 5, ser. 3 (1906), No. 1, p. 59–64. Abs., Exper. Sta. Rec., v. 18, p. 215.
Nature and concentration of alkali soil salts in Italy.

PERKINS, A. J. *Progress Report Concerning Reclamation of Salt Patch at Berri State Experimental Orchard.* Jour. Dept. Ag. So. Australia, v. 27 (1923), No. 4, p. 325–343.
Describes the accumulation of salts due to irrigation and the reclamation of the land by drainage and leaching.

PETERSON, W. See STEWART, R., and W. PETERSON, I.

PUCHNER, H. *Concerning the Transport of Soluble Salts by the Movement of Water in the Soil.* Forschungen auf dem Bebeite der Agriculture-Physik, v. 18 (1895), p. 1–25. Abs., Exper. Sta. Rec., v. 7, p. 272.
Laboratory tests of percolation and capillary movement with soils and waters of known composition. Tabular data.

ROBINSON, J. S. See HARRIS, F. S., and J. S. ROBINSON, I.

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II. ALKALI SOIL SALTS

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Brief outline of activities and methods of United States Reclamation Service in cement testing and concrete construction. Short review of experience with alkali-affected concrete and available information on such action.
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III. SEA WATER

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CAREY, A. E. *Carey on Portland Cement.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 107 (1891–92), p. 57, 60, 69.
Short discussion of action of sea water on concrete and results of experiments on gauging with sea water and exposure to it. Tabular data.

CARPENTER, W. T. See TUTTLE, A. S., K. ALLEN and W. T. CARPENTER. III.

CAY, W. D. *Durability of Portland Cement in Sea Water.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 100 (1889–90), p. 85–88.
Discusses tests on various cements in sea water by Vicat and Durand, Claye and Debray.

———. *Strength of Briquettes when Made with Fresh and Salt Water.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 62 (1879–80), p. 212.
Table showing comparative strengths in 7, 14, and 28 day tests.

CHAPMAN, C. M. *Results of Experiments upon Effect of Sea Water on Tensile Strength of Various Mixtures of Cement and Sand.* N. A. Cem. Users Proc., v. 6 (1910), p. 172–179. Eng. Rec., v. 61 (1910), p. 311.
Description of tests on briquettes. Diagrams of results. Discussion.

CHENOWETH, A. C. See VI.

CLARKE, E. C. *Experiment No. 8.* A. S. C. E. Trans., v. 14 (1885), p. 155.
Tests on mortar briquette made with and immersed in salt and fresh waters.

COIGNET. *Action of the Sea.* A. S. C. E. Trans., v. 1 (1868–1871), p. 110–115.
Describes sea water tests on concrete blocks of various compositions. Results and conclusions.

COLLIER, B. C. See VI.

CRARY, A. P. *Some Experiences with Concrete in the Republic of Panama.* Eng. N., v. 73 (1915), p. 214–216.
Describes construction and disintegration of concrete wharves at Panama City. Diagrams. Illustrated.

CZARNOMSKI, W. *On the State of Preservation of Test Blocks and Blocks Proceeding from the Harbor Works, Immersed in the Baltic Sea at Libon Harbor.* Int. A. T. M. Proc., v. 2 (1912), Paper No. 8, 19 p. Abs., Eng. Rec., v. 66 (1912), p. 329.
Chemical tests on fragments of masonry and concrete blocks after 8 to 14 years immersion. Tabular data. Illustrated.

CZARNOMSKI, W. and A. BAYKOFF. *On the Conditions of the Cement Blocks in Some of the Russian Ports in the Black and Caspian Seas.* Int. A. T. M., 5th Cong. (1909), Paper No. XI_2 and Suppl. to Cong. Doc. Int. A. T. M. Proc. (1908–1910), v. 1, No. XI_2. Int. A. T. M. (1906), Non-Off. Papers, B. 7f.

DAVIS, C. *Concrete for Maritime Structures.* N. A. Cem. Users. Proc., v. 6 (1910), p. 120–156. Abs., Concrete, v. 5 (1910), No. 6, p. 35–42. Exten. Abs., Eng. & Contr., v. 34 (1910), p. 180–185.
Discussion of past and present design and methods of construction of quay walls, docks, etc. Numerous descriptions and diagrams of such works. Illustrated.

DEBRAY, P. See DURAND-CLAYE, L., and P. DEBRAY. III.

DEFORGE. See LOMBARD and DEFORGE, III.

DODWELL, C. E. W. *Effect of Sea Water on Concrete Structures.* Can. Eng., v. 39 (1920), p. 279–280. Eng. & Contr., v. 54 (1920), p. 281–282.
Discusses deterioration of concrete piers in sea water at Annapolis Royal, Nova Scotia, after 3½ and 5 years exposure. Illustrated.

D'ROHAN, W. *The Effect of Sea Water, Alkali Water, and Sewage on Portland Cement and Methods for Counteracting same.* Eng. & Contr., v. 34 (1910), p. 52–55 (Ed. comment, p. 45).
General discussion and opinions of various engineers.
See also VI.

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Results of analyses of mortars after action by sea water, and permeability tests of unexposed parts of docks. Also comparative tests of magnesium sulphates and chlorides acting on mortars. Tabular data.

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DYCKERHOFF, R. *Effect of Included Sulphuric Acid on the Strength of Portland Cement Exposed to Sea Water.* Eng. N., v. 64 (1910), p. 4–5. Abs., Chem. Abs., v. 5 (1911), p. 581. Disc., Ton. Zeit., v. 33, p. 1234. Disc., Abs., Chem. Abs., v. 3 (1909), p. 2866, and v. 5 (1911), p. 2316. Disc., Cem. Age, v. 11 (1910), p. 118.
Results of German tests. Tabular data.

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Describes various structures in different parts of the world.

ENDELL, K. See IV.

EVERETT, H. A. *Fallacy of Concrete Ships.* Int. Marine Eng., v. 23 (1918), p. 61–62.
Challenges claims of superiority for concrete ships and discusses comparative merits. Reference to deteriorating action of sea water.

FAIJA, H. *Effect of Sea Water on Portland Cement.* London Society of Engineers. Trans., 1888, p. 49–62.
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FRAMM, F. See VI.

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Author desires to sell or lease formulæ for making cements proof against sea water alkali and atmospheric action.

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———. *Limestone Aggregate in Sea Water.* Concrete, v. 11 (1917), p. 88.
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———. *Steel in Concrete Construction in Sea Water.* Concrete, v. 15 (1919), p. 236–239. Exc., Eng. & Contr., v. 53 (1920), p. 94–95.
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See Aberthaw Construction Company, III.

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———. *Old Treatise Emphasized Same Points.* Eng. N. Rec., v. 80 (1918), p. 264, 267.
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KASAI, S. See VI.

KELLEY, W. F., and R. PICKWELL. *Alexandria Graving Dock, Belfast. Construction of a Concrete Graving Dock at Newport, Mon.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 111 (1892–93), p. 75–128.
Two papers with extensive discussion and correspondence. Discuss the construction, maintenance and behavior of these docks, with results of inspections, opinions, and experiences of many engineers with respect to durability of concrete structures in sea water.

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Poulsen, A., M. Gary and C. Schneider. *Influence of Sea Water on Cement and Concrete.* Conc. & Const. Eng., v. 5 (1910), p. 23–29. Eng. & Contr., v. 34 (1910), p. 51. Eng. N., v. 64 (1910), p. 3–4. Int. A. T. M. Proc., 5th Cong. (1909), Paper XI$_4$. Inst. Civil Eng. (Lond.) Min. & Proc., v. 193 (1912–13), Part III, p. 373. Cem. Age, v. 10 (1910), p. 184, 260.
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Rhett, A. H. *Porosity the Vital Point to Consider.* Eng. N. Rec., v. 80 (1918), p. 265, 267.
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(See Wig, R. J., and L. R. Ferguson, III.)

Rochemont, E. T. Q. de. *On Portland Cement Employed in the Works at Port of Havre Since 1870.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 107 (1891–92), p. 377–389.
Results of tensile and compressive strength tests, covering 17 years, on cement briquettes gauged with and exposed to sea water. Effects of storage of cement. Tables and diagrams.

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Saville, C. M. *Action of Sea Water on Concrete Blocks, Cristobal, Canal Zone.* Harvard Eng. Jour., v. 9 (1911), p. 197–213. Abs., Chem. Abs., v. 5 (1911), p. 2421.
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———. *Reinforced Concrete in Sea Water Structures.* Can. Eng., v. 44 (1923), p. 162.
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SHERTZER, T. B. *Further Examples of the Injury of Concrete Subject to Tidal Influence.* Eng. N., v. 60 (1908), p. 453. Abs. Chem. Abs., v. 3. (1909), p. 479. Abs. Cem. Age, v. 8 (1909), p. 53.
Discusses disintegration of concrete sea structures in Maine and New York. Describes tests on laboratory specimens made to ascertain cause.

SMITH, W. *Influence of Sea Water upon Portland Cement, Mortar and Concrete.* Inst. Civil Eng. (Lond.) Min. & Proc., v. 107 (1891–92), p. 73–198.
Description of investigation of concrete work at Aberdeen Harbor and general discussion of chemical deterioration of concrete in sea water. Discussion and correspondence by numerous engineers with accounts of many other tests and observations. Much technical detail. Tabulated data. Remedial measures.

SNOW, W. A. *Pronounced Reinforcement Corrosion Due to Sea Water or Electrolysis.* Eng. N. Rec., v. 87 (1921), p. 528–529.

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Discusses alumina cement as used in France. Much greater resistance to sea water.
See also II.

SPREGELBURG. See II.

SQUIRE, H. E. *Some Observations on Concrete in Sea Water in San Francisco Harbor.* Eng. N. Rec., v. 80 (1918), p. 575–577.
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V. WATERPROOFING OF CONCRETE

VARIOUS METHODS AND THE EFFECTS OF THEIR USE

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A report covering six investigations, including about 20,000 tests, with appendix covering further tests on 1,720 specimens. Effects of different percentages of the admixtures on mortars and concretes of various proportions and cements. Full description of tests and results. Conclusions regarding the following: Effect of powdered admixtures on tensile, compressive, and bond strengths; wear, plasticity, and yield, with respect to consistency, age, and proportions of mortar and concrete and kind and percentage of admixture. Waterproofing effects not considered. Eighteen diagrams and 32 tables.

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VI. ALKALI-RESISTANT CONCRETE

SPECIAL INGREDIENTS AND METHODS FOR PRODUCING RESISTANCE TO ALKALI AND SEA WATER; INCIDENTAL EFFECTS OF SAME

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